ERNEST ORLANDO LAWRENCE
BERKELEY NATIONAL LABORATORY

Integrated Functional Appraisal

Environmental Energy Technologies Division

FY 2004

IFA Team Members

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Executive Summary

The Environment, Health and Safety Division (EH&S) conducted an Integrated Functional Appraisal (IFA) of the Environmental Energy Technologies Division (EETD) during April and May 2004. The IFA consisted of initial scope discussions, record review, and inspection of the space to identify uncontrolled hazards and to recommend control measures. The scope of the IFA focused on areas where activities requiring formal authorizations took place. The inspection team consisted of specialists from EH&S, the EETD Safety Coordinator, and a U.S. Department of Energy Berkeley Site Office (DOE/BSO) observer.

A total of 115 observations were noted during the field inspections. The majority of these pertained to electrical safety, chemical safety, and machine guarding. These are summarized below. A detailed list of the IFA findings and recommended corrective actions is presented in Appendix 1.

Electrical Safety: Electrical safety issues included inappropriate use of extension cords, damaged electrical cords, improper cable trays bonding/grounding, and blocked electrical disconnects and panels. Several eyewash/safety showers or drench hoses are located near energized circuits. This was noted during the previous (FY 2001) IFA. A Laboratory-wide effort is underway to correct deficiencies of this nature.

Chemical Safety: In general, chemical safety was satisfactory, but some issues were noted, such as improper secondary containment, clutter in fume hoods, and labeling deficiencies.

Machine guarding: Several pieces of equipment (band saws, mills, belt sanders and drill presses) had exposed moving parts.

It should be noted that EETD had made a number of improvements since the last IFA was conducted in 2001. In particular, seismic safety, housekeeping, and ergonomics had greatly improved.

Safety within EETD has exceptional management support. The Division has a proactive safety program that is both innovative and effective. The commitment of EETD is proven by the condition of the spaces evaluated and the safety-conscious attitude demonstrated by the individuals (supervisors and staff members) encountered during the field visits.

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1 Introduction

EETD's mission is to perform research and conduct analyses that lead to better energy technologies and to reduce adverse energy-related environmental impact. These activities are carried out in 13 buildings (2, 46, 51, 51F, 53, 62, 63, 67, 70, 71, 71T, 90 and 903) which house approximately 65 laboratories and 275 offices.

The Integrated Functional Appraisal (IFA) is a key component of Berkeley Lab's Integrated Safety Management (ISM) system. It is part of Core Function number 5 (Continuous Improvement) of the ISM concept, and forms one of the three tiers of the Laboratory's safety-assessment program that evaluates the ongoing effectiveness of divisions' ISM programs. Berkeley Lab's EH&S Division has been conducting IFAs of all Laboratory organizations since 1996, with each organization undergoing review every three years. EETD's last IFA was conducted during 2001.

2 Appraisal Process

2.1 Determination of Scope, Preparation for Site Visits

An EH&S industrial hygienist was appointed as Team Leader to initiate, plan, and implement the IFA. He consulted with the EETD Safety Coordinator to develop the scope of the IFA walkthrough and selected team members to participate in the review. The scope was based primarily on the EETD FY-2004 Facilities Overview, with an emphasis on areas that had formal authorizations. The Facilities Overview is an internal EETD document that lists EH&S-related information, including activities conducted in EETD spaces, Activity Hazard Documents (AHDs), Radiological Work Authorizations (RWAs), Sealed Source Authorizations (SSAs), as well as Hazards Equipment Authorization Review (HEAR) and Chemical Management System (CMS) data. Other sources of information such as previous Division Self-Assessment reports, IFA reports, and information from the AHD database were considered as well. From this effort, an IFA scope listing the buildings and rooms to evaluate was developed. A representative number of offices and other areas having no formal authorizations were selected by the EETD Safety Coordinator for appraisal as well. It was agreed that the IFA would not duplicate other appraisal and information-gathering systems already in place. Therefore, issues such as Job Hazards Questionnaire (JHQ)/training completion, Supervisors Accident Analysis Reporting System (SAAR) investigation, and Satellite Accumulation Area (SAA) compliance were not evaluated.

2.2 Appraisal Team

The IFA Team Leader assembled an appraisal team consisting of the following individuals. Their respective areas of subject matter expertise are also listed.

Larry McLouth (EH&S) — IFA Team Leader, industrial hygiene, and laboratory safety
Matt Kotowski (EH&S) — General safety, accident prevention, and ergonomics
Kathi Wentworth (EH&S) — Occupational medicine, accident prevention, and ergonomics
Guy Kelley (EETD) — Division Safety Coordinator
Kim Abbott (DOE/BSO) — Observer

2.3 Site Visits

The appraisal team visited the sites on April 19, 21, 26, and May 5, 2004.

At the outset of the initial IFA inspection, the IFA Team Leader briefed the team and the DOE/BSO observer on the purpose, scope, schedule, conduct, and expectations of the IFA. Any EETD room occupants present during the inspection were also informed about the purpose of the IFA.

Forty-two separate rooms distributed throughout seven buildings were visited. Each room inspection consisted of walking through the space, asking staff about the work conducted, and recording observed ES&H issues as well as their corresponding corrective actions. These were logged on data sheets. Findings from each space were discussed with the EETD Safety Coordinator and the person responsible for that space (if present) at the time of the inspection before proceeding to the next space. The EETD Safety Coordinator updated the Division's Hazards, Equipment, Authorizations and Reviews (HEAR) data at the time of the inspections.

3 Inspection Results

Findings and recommended corrective actions resulting from the site visits are presented in Appendix 1. In general, spaces were well maintained. A total of 115 observations were noted during the field inspections. The majority of these were related to electrical safety, chemical safety, and machine guarding. These are summarized below. A detailed list of the IFA findings and recommended corrective actions is presented in Appendix 1.

Formal Authorizations: General observations indicated that EETD's formal authorizations adequately covered the hazards within the Division. However, one AHD (BE1000) had to be updated to include the use of chlorine gas.

Electrical Safety: Electrical safety issues included use of extension cords in lieu of permanent wiring, frayed/damaged electrical cords, lack of bonding and grounding of cable trays, and blocked electrical disconnects and panels. Moreover, several eyewash/safety showers or drench hoses are located near light switches, power outlets, laser interlock panels, and other energized circuits. This was noted during the previous (FY 2001) IFA. This poses a potential shock hazard. A Laboratory-wide effort is underway to correct deficiencies of this nature.

Chemical Safety: In general, chemical safety appeared to be well managed. Some issues were noted though. These included lack of or insufficient secondary containment, clutter in fume hoods, labeling deficiencies.

Machine guarding: Several pieces of equipment (band saws, mills, belt sanders, and drill presses) had exposed (unguarded) moving parts.

4 Noteworthy Practices

EETD addressed a number of safety concerns identified during last IFA (2001). Most notably were seismic safety, housekeeping, and ergonomics, which had all greatly improved. Very few seismic-related deficiencies were noted in the 2004 IFA. Housekeeping had improved dramatically as a result of Division management's involvement. For example, operations were suspended in a problematic wet chemistry laboratory until the area was cleaned. After inspection of the area, operations were allowed to resume but only after the area supervisor developed a plan of action to maintain his area to Division standards. Ergonomics has improved as a result of the Division's focus on evaluating workstations and providing funds to correct deficiencies.

5 Conclusion

Safety within EETD has exceptional management support. The EETD Division Safety Committee is comprised of the Deputy Division Director, Division Business Manager, Division Safety Manager, and the Division Safety Coordinator. It meets on an *ad hoc* basis and focuses on specific EH&S issues. Being comprised of upper-level management, the committee has the authority to allocate funds to correct deficiencies. The safety committee meets with the Division Council on a quarterly basis to keep senior management up to date.

The Safety Coordinator/Safety Manager team effectively administers the safety program, monitors conditions throughout the Division, and identifies issues that need management's attention. They have proven to be a valuable resource by keeping abreast of EH&S issues within the Division and by taking

immediate action on issues before they become problems. EETD's continued success will be assured provided that adequate time and resources are given to the Safety Coordinator/Safety Manager team to carry out their responsibilities.

Appendix 1 Technical Occupational Safety and Health Inspection Findings

No.	Bldg.	Room	Date	Finding	Corrective Action
1	46	157C	4/26/04	Unguarded lamps on lamp test rack	Install guards on bulbs or racks with screen, doors, or similar
2	46	157C	4/26/04	Aisle cluttered	Clean up aisle to remove trip hazards
3	46	159	4/26/04	Band saw guard inadequate under work table	Improve guard
4	53	101	4/26/04	Band saw lower guard not adjusted	Adjustment made on the spot
5	53	101	4/26/04	Bolted down machine tools w/ flexible power cords & plugs	Submit work request to have permanently wired
6	53	103	4/26/04	N Elect. panel inadequate access due to windows & frames	Clear 30" wide by 36" deep area in front of panel
7	53	103	4/26/04	W Elect. panel blocked by bicycle	Clear 30" wide by 36" deep area in front of panel
8	53	103	4/26/04	Considerable Styrofoam stored	Consult with Fire Marshal about fire rating and storage requirements
9	53	103B	4/26/04	Paint spray boot has no sprinkler	Consult with Fire Marshal about sprinkler requirement
10	53	103B	4/26/04	Milar sheet machine without guards for belts, pulleys, gears, etc.	Install guards
11	53	103B	4/26/04	Possible blocked access to blower disconnect switch	Consult with Tom Caronna
12	62	214B	5/5/04	No secondary containment used for liquids (e.g., acetone in fume hood No. 4)	Secondary containment should be large enough to hold 110% of the volume
13	62	214B	5/5/04	Heating mantle has defective cord (strain relief)	Repair or replace cord
14	62	220	5/5/04	In use 4% H2/He cylinder blocking access to eyewash/safety shower	Relocate cylinder
15	62	220	5/5/04	Access to eyewash/safety shower partially blocked by glovebox	Submit work request to rotate eyewash 45 deg
16	62	220	5/5/04	Laboratory personnel have to climb on countertop to access chemicals stored on shelves	Use an 8-foot ladder until adequate storage can be found
17	62	238	5/5/04	Disconnect is blocked by laser table	Consult with Tom Caronna

No.	Bldg.	Room	Date	Finding	Corrective Action
18	62	246B	5/5/04	Table obstructs panel	Clear 30" wide by 36" deep area in front of panel
19	62	246B	5/5/04	Combustible materials next to hotplate/stirrer in glovebox	Abated on site
20	62	246B	5/5/04	All gloveboxes except No. 1 has an EH&S inspection sticker on it	Consult with John Seabury
21	62	246B	5/5/04	Glovebox No. 1 - left glove has hole in finger repaired with duct tape	Replace glove
22	62	246B	5/5/04	Lots of clutter and chemicals in glovebox	Review current chemical usage and keep what is needed
23	63	101	5/5/04	Aisle has 24" clearance. 28" is required. This exists in several areas	Relocate shelves and cabinets
24	63	101	5/5/04	In-running nip point under table of 1-inch belt sander	Install guard
25	63	101	5/5/04	Panel on S wall is obstructed on sides	Consult with Tom Caronna
26	70	103	4/19/04	Work bench has transite sheet with loose fibers protruding from holes	Researcher doesn't need bench. EH&S to provide guidance for disposal
27	70	103	4/19/04	Clutter in Fume Hood No. 3	Remove clutter
28	70	103	4/19/04	Centrifuge has no interlock — Fume Hood No. 2	Researcher removed from service
29	70	103	4/19/04	Centrifuge has no interlock — Fume Hood No. 4	Disconnect from service
30	70	108C	4/19/04	Panel and disconnect are blocked by portable file	Clear 30" wide by 36" deep area in front of panel
31	70	108C	4/19/04	Unapproved cable from Panel PNL-140-70 — Use is unknown, but probably ground wire	Consult with Tom Caronna
32	70	108C	4/19/04	Access/Egress — Unrestrained files stacked along aisle near exit	Relocate the files or consider lateral file cabinet
33	70	108C	4/19/04	Plug in outlet on E wall has exposed wires	Repair or replace
34	70	108C	4/19/04	Cable trays - No evidence of bonding and grounding	Consult with Tom Caronna
35	70	108C	4/19/04	Lead vault not seismically anchored	Submit work request
36	70	123	4/19/04	Insufficient guarding on Delta mill, band saw, belt sander, & drill press	Install guards — OSHA finding
37	70	123	4/19/04	Elephant trunk not tested by EH&S	Enter into EH&S testing database

No.	Bldg.	Room	Date	Finding	Corrective Action
38	70	123	4/19/04	Seismic anchor for brake was unbolted	Replace bolts with pins to allow moving the brake when needed
39	70	133	4/19/04	X-ray producing equipment	Have Ted Decastro evaluate use, authorization, & signage
40	70	133	4/19/04	Microdrill's top is removed, exposing mechanism	Replace top or guard, otherwise discontinue use
41	70	133	4/19/04	2 disconnects in NE corner blocked by X-ray equipment	Consult with Tom Caronna
42	70	133	4/19/04	Signal cable used for 110 V to power warning light at entrance. This is also an open penetration.	Submit work request — rewire or disconnect and close penetration.
43	70	134	4/19/04	HCl container barcode CH276598 on container but not in CMS	Enter into CMS & confirm that this is an isolated incident
44	70	134	4/19/04	Flexible gas line penetrates wall; fire safety issue	Submit work request for noncombustible tubing & fire sealing
45	70	134	4/19/04	Unlabeled volumetric flask & beaker w/ clear liquid, and glass container w/ pink powder	Label contents and primary hazards
46	70	141	4/19/04	Eyewash/safety shower blocked by 5' steel tubes	Abated on site
47	70	141	4/19/04	Electrical safety issues: e.g., use of extension cords in place of permanent wiring, bonding, and grounding of cable trays	These will be resolved in the move to 70-173
48	70	157	4/19/04	Water line and power cables are in the same cable tray	Consult with Tom Caronna
49	70	157	4/19/04	Panel blocked in NW wall	Clear 30" wide by 36" deep area in front of panel
50	70	157	4/19/04	Blocked disconnect on E wall	Clear 30" wide by 36" deep area in front of panel
51	70	157	4/19/04	No strain relief on digital thermometer cord, E wall	Repair
52	70	157	4/19/04	Cable trays — no evidence of bonding and grounding	Consult with Tom Caronna
53	70	163	4/19/04	Container of 2-butoxyethylacetate had no CMS barcode	Ensure all chemicals entered into CMS
54	70	163	4/19/04	Door between 163 and 157 not interlocked for laser safety. Also large gap in door; laser safety hazard	Consult with Ted Decastro

No.	Bldg.	Room	Date	Finding	Corrective Action
55	70	163	4/19/04	Flexible wiring runs from outlet by fume hood to cable tray	Consult with Tom Caronna
56	70	163	4/19/04	Signal and power cables in same cable tray	Consult with Tom Caronna
57	70	163	4/19/04	Cable trays; no evidence of bonding and grounding	Consult with Tom Caronna
58	70	163	4/19/04	Cable running through door between 163 and 157	Consult with Tom Caronna
59	70	163	4/19/04	No guard on Accu Cutter paper cutter	Install guard
60	70	163	4/19/04	Tubing stored in cable trays	Remove tubing
61	70	163	4/19/04	S door to loading dock not interlocked for laser safety, and no "keep locked" sign	Consult with Ted Decastro
62	70	163	4/19/04	Calcium gluconate gel 1 mo. Over age	Exchange for new tube at Health Services
63	70	174	4/19/04	Unused portion of blade on horizontal band saw is exposed	Enclose unused portion
64	70	174	4/19/04	Guard is loose on the back of band saw	Repair
65	70	174	4/19/04	Extension cord (in cable tray) used in lieu of permanent wiring	Consult with Tom Caronna
66	70	174	4/19/04	Cable trays; no evidence of bonding and grounding	Consult with Tom Caronna
67	70	174	4/19/04	Signal cable penetrating S wall - fire safety issue	Submit work request
68	70	201	4/21/04	Eyewash/safety shower blocked	Abated on site
69	70	201	4/21/04	Using extension cord for stirrer	Connect directly to outlet
70	70	201	4/21/04	Secondary containment too small for large 5 gallon waste can	Secondary containment should be large enough to hold 110% of the volume
71	70	201	4/21/04	S bench circuit breaker obstructed & unlabeled. In use?	Consult with Tom Caronna
72	70	215	4/21/04	There is heat tape on the inlet duct near door	Consult with Tom Caronna re: possible need for GFCI
73	70	215	4/21/04	Lack of secondary containment for chemicals in & under fume hood	Obtain drip tray from stores
74	70	215	4/21/04	Fume hood inspection out of date	Consult with John Seabury
75	70	217	4/21/04	5-gallon cans connected to airline - possible pressure hazard	Must used approved containers rated for pressure
76	70	217	4/21/04	Housekeeping is poor	Clean area

No.	Bldg.	Room	Date	Finding	Corrective Action
77	70	217	4/21/04	Bottom panel of equipment rack pulled our exposing wires	Close the panel
78	70	217	4/21/04	3 - 200 scf cylinders of 0.5 % CO, 356 ppm CO and 500 ppm NO found in room; no authorization to use these gases	Either remove gases or develop an AHD with a hazard analysis for their use
79	70	217	4/21/04	Exposed ends of bolts protruding from chamber; bump hazard	Put caps on exposed ends
80	70	218	4/21/04	Panel is too close to the eyewash/safety shower	EH&S will consult with Facilities for corrective action
81	70	218	4/21/04	Guard on vacuum pump is not large enough	Submit work request
82	70	223	4/21/04	Panel obstructed by gas lines (N wall)	Reroute gas lines
83	70	223	4/21/04	2 wall-mounted pressure receivers; not rated	No longer in use; remove
84	70	223	4/21/04	Thermal desorption tube conditioner in hood; possible exposed voltage on heating sleeves. Also plugged into power tap along with refrigerator.	Consult with Tom Caronna
85	70	249	4/21/04	Poor housekeeping	Clean area
86	70	249	4/21/04	Pressure vessel last tested on 9/17/9	Confirm this is within testing frequency
87	70	249	4/21/04	Methane cylinder has a 200 psi second stage	Is this necessary? If not use a second stage for anticipated pressure range
88	70	249	4/21/04	5-gallon containers of Sibond (apparently used for aerogel work which has been discontinued) are stored	Dispose of this and other materials in the waste stream if it is no longer used
89	70	258	4/21/04	There are bare incandescent & fluorescent light bulbs in the clean bench	This needs to have a guard
90	70	264	4/21/04	Table top centrifuge (GLC 1) has no interlock	Either install an interlock or replace it with a unit that has one
91	70	264 A	4/21/04	Carbon monoxide (40 ppm) and ammonia are stored in this area	If in use or planned for use, review hazards; establish controls, which may include an AHD. Otherwise return to vendor.
92	70	269	4/21/04	Fume hoods 3,4,5,6, and 7 do not have current EH&S Inspection sticker	Contact John Seabury

No.	Bldg.	Room	Date	Finding	Corrective Action
93	70	269	4/21/04	500 ppm NO is stored in lab with regulator attached	Remove regulator and put on valve cap
94	70	269	4/21/04	Centrifuge has no interlock	Either install an interlock or replace unit
95	70	269A	4/21/04	Filing cabinet is not seismically anchored	Submit work request
96	70	275	4/26/04	Aisle blocked with shipping case, furniture, etc.	Clear aisle
97	70	275	4/26/04	Housekeeping is poor	Clean area and organize
98	70	275	4/26/04	Approx. 3-gal compressed air tank without relief valve	Install relief valve. (Press gauge may be lowest press component.)
99	70	275	4/26/04	Open electrical junction box over door	Contact Work Request to have cover installed
100	70	278	4/21/04	Housekeeping is poor	Clean area
101	70	291	4/26/04	Lab user not familiar with laser LOTO procedures. Existence of written laser LOTO procedures not apparent.	Confirm written laser LOTO procedures
102	70	291	4/26/04	Cable trays; no evidence of bonding and grounding	Consult with Tom Caronna
103	70	295	4/26/04	Panel blocked on E wall	Clear 30" wide by 36" deep area in front of panel
104	70	295	4/26/04	Possible inadequate clearance for disconnect switch on E wall	Consult with Tom Caronna
105	70	295	4/26/04	Leaking electrode & salt deposits on counter	Clean area
106	71T	101	4/26/04	Unistrut racks in aisle way	Clear aisle of trip hazards and potential blockage during earthquake
107	90	3145A	5/5/04	Partitions along aisle way is not anchored	Submit work request
108	90	3145D	5/5/04	Three-shelf bookcase not anchored	Submit work request
109	90	3145F	5/5/04	Heater plugged into power strip	Plug into a wall outlet
110	90	3145J	5/5/04	Four-legged chairs in use	Replace with five-legged chairs (recommendation)
111	90	3147	5/5/04	Aisle has 24" clearance. 28" is required.	Relocate table
112	90	3147	5/5/04	Four-legged chairs in use	Replace with five-legged chairs (recommendation)
113	90	3147B	5/5/04	Refrigerator plugged into power strip	Plug into a wall outlet

No.	Bldg.	Room	Date	Finding	Corrective Action
114	90	3147B	5/5/04	Black bookshelf and 3 filing cabinets are not anchored	Submit work request
115	90	3147B	5/5/04	Electrical cord running through doorway from 3147	Remove